

**CLAIMS**

What is claimed is:

1. In a pilot-operated valve having:

a. a valve body, including an inlet portion and an outlet portion, said inlet and outlet portions adapted to be controllably interconnected via a main piston bore portion having a first orifice and a main piston, one relatively movable to the other; and an operator bore portion, having a second orifice, perpendicular to said main piston bore portion adapted to be controllably interconnected with said main piston bore portion and said outlet portion; and

b. an operator/actuator assembly, operatively attached to said valve body operator bore portion, including a normally closed plunger assembly adapted to be in a sealing relationship relative to said second orifice, thereby blocking the communication between said main piston bore portion and said valve body outlet portion; and an actuating mechanism for controllably actuating said plunger assembly into a non-sealing relationship relative to said second orifice, said second orifice and said plunger assembly serving as a pilot portion of said valve, the improvement comprising:

i. an override assembly bore located within said valve body substantially perpendicular and tangential to said main piston bore portion as well as being perpendicular and radial to said operator bore portion; and

ii. a manual override assembly sealingly and controllably rotationally retained within said override assembly bore, said assembly including a generally cylindrical stem having a tool actuation portion, on one end of said stem, extending from said override assembly bore; a cam portion, on the other end of said stem, extending radially into said valve body operator bore portion and adapted, upon actuation of said override assembly, to physically separate said plunger assembly from a sealing relationship between said plunger assembly and said second orifice; and an actuating surface, intermediate said tool actuation portion and said cam portion, extending tangentially into said main piston bore

27           portion and adapted, upon actuation of said override assembly, to physically  
28           separate said main piston from a sealing relationship between said main piston  
29           and said first orifice.

1       2.       The improved pilot-operated valve of claim 1, wherein the manual actuation of  
2       said plunger assembly, via said cam portion, and of said main piston, via said actuating  
3       surface, is sequential.

1       3.       The improved plunger assembly of claim 2, wherein the actuation of said plunger  
2       assembly is fully completed prior to the actuation of said piston.

1       4.       The improved pilot-operated valve of claim 3, wherein the actuation of said  
2       plunger assembly is completed within a first 90-degree rotation of said stem.

1       5.       The improved pilot-operated valve of claim 4, wherein the actuation of said main  
2       piston is completed within a second 90-degree rotation of said stem.

1       6.       The improved pilot-operated valve of claim 5, wherein said first and second 90  
2       degree rotations are adjacent and sequential.

1       7.       The improved pilot-operated valve of claim 6, wherein the actuations of said  
2       plunger and said main piston are separated via a predetermined rotational dwell period of  
3       said stem.

1       8.       The improved pilot-operated valve of claim 7, wherein the rotational dwell period  
2       of said stem is in the range of 50 to 55 degrees.

1       9.       The improved pilot-operated valve of claim 1, wherein said stem further includes  
2       a rotation-direction limiting portion, for said cam portion, intermediate said cam portion  
3       and said actuation surface.

1 10. The improved pilot-operated valve of claim 1, wherein said actuating mechanism  
2 for said plunger assembly takes the form a remote-controlled solenoid.

1 11. The improved pilot-operated valve of claim 1, wherein said main piston is  
2 normally biased into a sealing relationship with said first orifice.

1 12. The improved pilot-operated valve of claim 1, wherein, when said valve is under  
2 pressure, once said pilot portion is opened by the manual action of said stem cam portion,  
3 said piston is shifted, via said pressure, away from a sealing relationship with said first  
4 orifice, thereby opening said first orifice and thus permitting communication between  
5 said inlet and outlet portions.

1 13. The improved pilot-operated valve of claim 10, wherein, upon the completion of  
2 the continued manual actuation of said stem, said actuating surface blocks said piston,  
3 away from a sealing relationship with said first orifice, when said valve is not under  
4 pressure.

1 14. The improved pilot-operated valve of claim 1, wherein, when said valve is not  
2 under pressure, said manual override assembly sequentially separates said plunger  
3 assembly and said main valve piston in one continuous 180 degree turn of said stem.

1 15. The improved pilot-operated valve of claim 1, wherein, depending both upon the  
2 direction of rotation of said stem actuating surface and whether said valve is under  
3 pressure, one of blocks said piston from a sealing relationship with said valve first orifice  
4 and separates said main piston from a sealing relationship with said first orifice.

1 16. The improved pilot-operated valve of claim 1, further including a plurality of O-  
2 ring seals on said stem for sealing said cam portion and said actuating surface.

1 17. A pilot-operated valve having a valve body, having inlet and outlet portions  
2 controllably interconnected via a main piston bore portion having a first orifice; a main  
3 piston sealingly movable within said main piston bore in a normally biased sealing  
4 relationship relative to said first orifice; and an operator portion, having a second orifice,  
5 perpendicular to said main piston bore portion, controllably interconnected with said  
6 main piston bore and outlet portions; an operator assembly connected with said operator  
7 bore portion, including a movable plunger assembly normally biased into a sealing  
8 relationship relative to said second orifice, thereby blocking the communication between  
9 said main piston bore and said outlet portion; and an actuating mechanism for  
10 controllably actuating said plunger assembly away from the sealing relationship relative  
11 to said second orifice, said second orifice and said plunger assembly cooperating to serve  
12 as a pilot portion of said valve, an improvement comprising:

13 a. a further generally cylindrical bore located within said valve body  
14 substantially perpendicular as well as tangential to said main piston bore portion and  
15 being perpendicular as well as radial to said operator bore portion; and

16 b. an override assembly sealably and rotationally controllably retained within  
17 said further bore, said assembly including a generally cylindrical stem having a  
18 manually-operated sealed tool actuating portion on one end thereof; a sealed cam portion,  
19 on the other end of said stem, extending radially into said operator bore portion and, upon  
20 a first predetermined extent of rotation of said stem, physically separating said plunger  
21 assembly from said sealing relationship with said second orifice; and an actuating surface  
22 on said stem extending tangentially into said main piston bore portion and, upon a second  
23 predetermined extent of rotation of said stem, physically separating said main piston from  
24 said sealing relationship with said first orifice.

1 18. The improved pilot-operated valve of claim 17, wherein said actuating surface is  
2 located between said tool actuation portion and said cam portion.

1 19. The improved pilot-operated valve of claim 17, wherein said first and second  
2 predetermined extents of rotation are sequential.

1 20. The pilot-operated valve of claim 19, wherein said first predetermined extent of  
2 rotation is about 90 degrees.

1 21. The pilot-operated valve of claim 20, wherein said second predetermined extent  
2 of rotation is about 90 degrees.

1 22. The pilot-operated valve of claim 21, wherein said first and second predetermined  
2 extents of rotation are adjacent and substantially sequential.

1 23. The pilot-operated valve of claim 17, wherein, when said valve is not under  
2 pressure, said manual override assembly sequentially separates said plunger assembly  
3 and said main piston valve from their respective sealing relationships in one continuous  
4 about 180 degree rotation.

1 24. The pilot-operated valve of claim 17, wherein, depending upon the direction of  
2 rotation of said stem actuating surface and, depending upon whether said valve is under  
3 pressure, either blocks said piston from the sealing relationship with said first orifice or  
4 separates said main piston from the sealing relationship with said first orifice.

1 25. A method for actuating a pilot-operated valve having a valve body including inlet  
2 and outlet portions controllably interconnected via a main piston bore having a first  
3 orifice; a main piston sealingly movable within said main piston bore in a normally  
4 biased relationship relative to said first orifice; and an operator portion, having a second  
5 orifice, perpendicular to said main piston bore portion, controllably interconnected with  
6 said main bore and outlet portions; an operator assembly connected with said operator  
7 bore portion, including a movable plunger assembly normally biased into a sealing  
8 relationship relative to said second orifice; an actuating assembly for controllably  
9 actuating said plunger assembly, said second orifice and said plunger assembly  
10 cooperating to serve as a pilot portion of said valve; a further generally cylindrical bore,  
11 located within said valve body, substantially perpendicular as well as tangential to said

12 main piston bore portion and being perpendicular as well as radial to said operator bore  
13 portion; and an override assembly sealably retained within said further bore, said override  
14 assembly including a generally cylindrical stem having a sealed tool actuating portion on  
15 one end thereof, a sealed cam portion on the other end thereof extending radially into said  
16 operator bore portion, and an actuating surface on said stem extending tangentially into  
17 said main piston bore portion, said method comprising the steps of:

18 a. manually rotating said tool actuating portion for a predetermined extent of  
19 rotation of said override assembly;

20 b. physically separating said plunger assembly from said sealing relationship  
21 with said second orifice during a first portion of said predetermined extent of rotation;  
22 and

23 c. physically separating said main piston from said sealing relationship with  
24 said first orifice during a second portion of said predetermined extent of rotation.

1 26. The method of claim 25, wherein said first and second portions of said  
2 predetermined extent of rotation are adjacent and sequential.

1 27. The method of claim 26, wherein said first portion of said predetermined extent of  
2 rotation is about 90 degrees.

1 28. The method of claim 27, wherein said second portion of said predetermined  
2 extent of rotation is about 90 degrees.

1 29. The method of claim 25, wherein said predetermined extents of rotation consists  
2 of one continuous about 180 degree rotation of said override assembly.

1 30. The method of claim 25, wherein, when said valve is not under pressure, said  
2 manual rotating of said tool actuating portion sequentially physically separates said  
3 plunger assembly and said piston valve from their respective sealing relationships in one

4 continuous about 180 degree rotation encompassing both said first and second portions of  
5 said predetermined extent of rotation.

1 31. The method of claim 25, wherein, depending upon the direction of manually  
2 rotating of said stem actuating surface and, depending upon whether said valve is under  
3 pressure, either blocks said piston from the sealing relationship with said first orifice or  
4 separates said main piston from the sealing relationship with said first orifice during said  
5 second portion of said predetermined extent of rotation.

1 32. The method of claim 25, wherein said first portion of said predetermined extent of  
2 rotation further includes another portion of said stem for limiting the rotation-direction of  
3 said cam portion.